United States Court of Appeals for the Federal Circuit

2008-1578
(Interference No. 105, 477)

THOMAS J. YORKEY,

Appellant,

v.

MOHAMED K. DIAB, ESMAIEL KIANI-AZRBAY JANY, and WALTER M. WEBER,

Appellees.

Judgment

ON APPEAL from the United States Patent and Trademark Office, Board of Patent Appeals and Interferences

in Interference No. 105, 477

This CAUSE having been heard and considered, it is

ORDERED and ADJUDGED:

AFFIRMED

ENTERED BY ORDER OF THE COURT

DATED APR 7 - 2010

Jan Horbaly, Clerk

ISSUED AS A MANDATE: MAY 14 2010

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Appellees.

Robert C. Morgan, Ropes & Gray LLP, of New York, New York, argued for appellant. With him on the brief was Marina Len.

Joseph R. Re, Knobbe, Martens, Olson & Bear, LLP, of Irvine, California, argued for appellees. With him on the brief were Brenton R. Babcock, Irfan A. Lateef and Jarom D. Kesler.

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Appeal from the United States Patent and Trademark Office, Board of Patent Appeals and Interferences.

DECIDED: April 7, 2010

Before MICHEL, Chief Judge, Gajarsa, Circuit Judge, and Kendall, District Judge[1].

MICHEL, Chief Judge.

Appellant Thomas J. Yorkey ("Yorkey") appeals from a ruling of the Board of Patent Appeals and Interferences (the "Board") denying his motion for judgment that claim 39 of Appellees Mohamed K. Diab, Esmaiel Kiani-Azraby Jany and Walter M. Weber's (collectively "Diab") U.S. Patent Application Ser. No. 09/111,604 (the "Diab application") fails to comply with the written description requirement of 35 U.S.C. § 112, ¶ 1. Yorkey also appeals the Board's denial of his motion for judgment of no

[1] Hon. Virginia M. Kendall, U.S. District Court for the Northern District of Illinois, sitting by designation.

interference-in-fact with respect to Yorkey's U.S. Patent No. 5,645,060 (the "Yorkey patent"). We affirm the Board's rulings.

PROCEDURAL HISTORY

The Yorkey patent and Diab application both claim inventions and methods for measuring the concentration of oxygen in blood. Yorkey is named as the inventor of the Yorkey Patent, which issued on July 8, 1997 and was based on U.S. Application Ser. No. 08/490,315, filed on June 14, 1995. The patent was subsequently assigned to Nellcor Puritan Bennet, Inc. ("Nellcor") which is the party in interest. Diab is the named inventor on the basis of the Diab application filed on July 6, 1998, which claims priority in turn from U.S. Application Ser. Nos. 08/859,837 (filed May 16, 1997) and 08/320,154 (filed October 7, 1994); the party in interest in the Diab application is Masimo Corporation of Irvine, California.

An interference (No. 105,477) was declared by the Board on July 18, 2006. The interference comprised a single count, Count 1, corresponding to claim 6 of the Yorkey patent and claim 39 of the Diab application. As in the companion interference to this case, Yorkey was designated the junior party and Diab the senior party. See Yorkey v. Diab, No. 2008-1577 (hereinafter "Yorkey I"). On June 28, 2007, the Board ruled on two motions brought by Yorkey, denying both his motion for judgment that claim 39 of the Diab application fails to comply with the written description requirement of 35 U.S.C. § 112, ¶ 1 ("Motion 1") and his motion for judgment of no interference-in-fact ("Motion 2"). The Board subsequently denied Yorkey's motion for judgment based on priority of invention and, on May 28, 2008, awarded priority to the Diab application and invalidated the Yorkey patent. This appeal timely followed.

BACKGROUND

The technology at issue in this case is medical instrumentation and methods for the noninvasive measurement of the concentration of oxygen in the blood of a patient (saturation) and has been described in the companion opinion to this case. Count I of the interference corresponds to Claim 6 of the Yorkey patent and claim 39 of the Diab application. Yorkey Claim 6 recites:

> A method for measuring saturation of a blood constituent in a patient comprising the steps of:
> . . . .
> representing each of said intensity signals as a function of said saturation, the wavelength corresponding to the intensity signal, and a time-variable motion term corresponding to motion noise, said motion terms being proportional to one another for each of said intensity signals; and
>
> solving the three functions to obtain a value for said saturation,
>
> wherein each of said functions includes a plurality of coefficients, and further comprising the step of determining a set of coefficients for said third intensity signal from a measurement in the absence of motion noise and a determination of said saturation from said first and second intensity signals.

Whereas Diab Claim 39 recites:

> A method for measuring saturation of a blood constituent in a patient comprising the steps of:
> . . . .
> representing each of said intensity signals as a function of concentration, the wavelength corresponding to the intensity signal, and a time-variable motion term corresponding to motion noise, said motion terms being proportional to one another for each of said intensity signals; and
>
> solving the functions to obtain a value for said saturation,
>
> wherein each of said functions includes a plurality of coefficients related to the wavelengths, the coefficients of said third function being determined based upon the coefficients of the first and second functions, and further comprising the steps of approximating at least a portion of said first and second intensity signals based upon the third intensity signal, and

determining said saturation from said approximation of said first and second intensity signals.

(material variations in text emphasized).

The principal issue of this appeal stems from the last two limitations of each claim. In the penultimate limitation of its claim 6, the Yorkey patent specifies that "three functions" (one derived from the signal detected at each wavelength of light emitted by the sensor probe) are solved to obtain a saturation value, whereas the corresponding limitation of the Diab application states that "the functions" are solved to obtain a saturation value.

The final limitations of the respective claims also differ in the language they employ. The Yorkey patent states that its steps constitute a determination of a set of coefficients for the third measured intensity signal from a measurement in the absence of motion noise, and a determination of oxygen saturation from the first and second intensity signals. The corresponding claim limitation from the Diab application recites that the coefficient of the third function is determined based upon the coefficients determined for the first and second signals, and that subsequent steps approximate at least a portion of the first and second intensity signals based upon the third intensity signal. The oxygen saturation is subsequently derived from an approximation of the first and second intensity signals.

DISCUSSION

We have jurisdiction to hear this appeal under 28 U.S.C. § 1295(a)(4)(A) and 35 U.S.C. § 141. See In re Ferguson, 558 F.3d 1359, 1362 (Fed. Cir. 2009).

Because Yorkey's appeal challenges the Board's claim construction, we first address Yorkey's Motion 2, seeking a judgment of no interference-in-fact. As the junior

party, Yorkey has the burden of showing, by a preponderance of the evidence, that the Diab application's claim 39 and the Yorkey patent's claim 6 do not interfere-in-fact. See 37 C.F.R. § 41.202(d); In re Garner, 508 F.3d 1376, 1377 (Fed. Cir. 2007).

The standard for determining whether an interference exists is set forth in 37 C.F.R. § 41.203(a):

> An interference exists if the subject matter of a claim of one party would, if prior art, have anticipated or rendered obvious the subject matter of a claim of the opposing party and vice versa.

Under this standard, Yorkey must prove either that its claims, if prior art, would neither have anticipated, nor have rendered obvious, the subject matter of Diab's claim or vice versa.

Determination that a claim is anticipated under 35 U.S.C. § 102(b) involves two analytical steps: (1) the Board must interpret the claim language; and (2) the Board must then compare the construed claim to a prior art reference and make factual findings that "each and every limitation is found either expressly or inherently in [that] single prior art reference." In re Crish, 393 F.3d 1253, 1256 (Fed. Cir. 2004) (quoting Celeritas Techs. Ltd. v. Rockwell Int'l Corp., 150 F.3d 1354, 1360 (Fed. Cir. 1998) (alteration in original). We review those factual findings for substantial evidence. In re Gartside, 203 F.3d 1305, 1315 (Fed. Cir. 2000). Because we find that the asserted Yorkey patent claim was anticipated by the corresponding claim of the Diab application, we need not address the question of obviousness.

Moreover, because the PTO, in its claim construction, is entitled to give claims their broadest reasonable interpretation, our review of the Board's claim construction is limited to determining only whether the claim construction was reasonable. See 37

C.F.R. § 41.200(b) ("A claim shall be given its broadest reasonable construction in light of the specification of the application or patent in which it appears."); Crish, 393 F.3d at 1256 ("[O]ur review of the Board's claim construction is limited to determining whether it was reasonable.").

Both parties agree that the initial issue in this appeal turns upon the Board's construction of Diab's claim 39. Yorkey argued to the Board that the claims at issue differ because "[c]laim 39 of Diab's . . . application uses only two functions to obtain saturation, and recites 'approximating at least a portion of said first and second intensity signals based upon the third intensity signal', whereas claim[ ] 6 . . . of Yorkey's . . . patent use[s] all three functions to obtain saturation, and do[es] not approximate a portion of the first and second intensity signals based upon the third intensity signal."

Yorkey's expert witness, Dr. Elvir Causevic ("Causevic"), stated that each of the three wavelength intensity signals is directly used in the final calculation of saturation by the use of matrix algebra. Causevic testified that, in contrast, Diab's claimed invention obtains the saturation value "based on solving two (not three) functions to calculate its saturation and using the third wavelength for 'approximating at least a portion of said first and second intensity signals based upon the third intensity signal.'"

Diab's expert, Dr. Gail D. Baura ("Baura"), disagreed that the language of "solving the three functions" differed from that of "solving the functions." According to Baura:

> Neither the Yorkey claims, nor the Diab [c]laim include a limitation requiring that the signals be used without further steps and the functions be solved together to calculate the saturation directly. The Yorkey claims recite "solving the three functions to obtain a valued [sic, value] for said saturation." This limitation does not include a requirement that the signals be used without further steps and/or the functions be solved together.

(alterations in original). Baura further disagreed with Causevic that the Diab application's claim does not solve the three functions together, but uses the three functions in a few consecutive calculations. According to Baura:

> A person of skill in the art would have knowledge of mathematics and linear algebra and understand that here there is no substantive difference between solving three functions together and solving them consecutively. ... It is well known in the art that while matrix algebra can be used to simplify mathematical calculations, in substance it performs the same task of solving functions consecutively. In fact, a matrix is simply another way of writing linear algebraic equations.

With respect to the final pair of limitations commencing with "wherein", Causevic testified that in Yorkey's limitation:

> [T]he coefficients of the third wavelength function are determined by taking measurements in the absence of motion noise and determining saturation from first and second intensity signals....These coefficients are then used when intensity measurements are taken in the presence of motion, and all three wavelength functions are solved to obtain a value for saturation.

Causevic averred that Diab's corresponding limitation claimed "something different" because Diab did not claim a "calibration step" but rather "the ultimate determination of saturation based on only two wavelengths", where "the third wavelength is used . . . solely to generate a reference signal"

Baura disagreed, observing that Causevic's testimony established that Yorkey's claim limitation read on a determination in which the "coefficients of the third wavelength have to based at least in part on the coefficients of the first and second intensity functions." Baura further testified that: "[t]he step of approximating a portion of the first and second signals is a step in the process of solving the three functions." Moreover:

> [I]t would have been obvious to a person of skill in the art . . . to eliminate the Diab method of approximating a portion of the first and second signals

> based on the third signal first and using the approximation to calculate the saturation by putting the functions into a matrix and solving the matrix.... Thus, a person of ordinary skill in the art having three linear functions would have found it obvious to go from solving the functions consecutively to pulling all three in a matrix and solving them together.

The Board found Baura's testimony to be more credible than that of Causevic because it was more consistent with the language of the claims. The Board was not persuaded by Yorkey's argument that solving the three functions to obtain a value for oxygen saturation required solving the three functions directly or simultaneously, observing that Yorkey did not point to any terms in the claims or any description in the specification that compelled such a narrow construction of its own claims. Such a narrow construction, held the Board, was not consistent with 37 C.F.R. § 41.200(b)'s mandate that a claim be given the broadest reasonable construction.

Nor did the Board accept Causevic's argument that Yorkey's claims exclude the Diab application's approximation step; rather, it accepted Baura's contention that the approximation step is simply a step in the solving of the three functions. The Board held that, rather than exclude such approximation steps, Yorkey's claim, when properly construed, embraced them.

On appeal, Yorkey argues the Board erred in assuming a construction of Diab's claim 39 that equated "solving the functions to obtain a value for saturation" with "solving the three functions to obtain a value for saturation." (emphasis in original). This is improper, contends Yorkey, because the language of the limitation states that a saturation value is determined from only two of the signals, with the third one merely serving as a noise reference to be subtracted. Thus, Diab's claim 39 cannot be construed to require "solving the three functions to obtain a value for saturation."

According to Yorkey, "such a construction would necessarily require that, regardless of which functions are solved for saturation, all three must represent a signal as a function of saturation and be solved as such."

Yorkey's argument fails. The specification of the Diab application provides, in Equations (93), (94), and (95), the three functions derived from each of the three signals recorded from the probe. Each of these functions is time-dependent, as indicated by the term $S_{\lambda n}(t)$ for each function, where n equals one of the three signals, Red1, Red2, or IR. Factors in each function are $\varepsilon_{HbO2,\lambda n}c^{A}$, representing the concentration of oxygenated hemoglobin in the blood, and $n_{\lambda n}(t)$, a noise component. Diab teaches that each function is solved sequentially to obtain a value for oxygen saturation Thus, contra Yorkey, all three functions represent a signal as a function of saturation, and the sequential process of the functions' solution is necessarily required to obtain a final value for saturation.

For these reasons, we find that the Board's denial of Yorkey's motion for judgment of no interference-in-fact is supported by substantial evidence, and we consequently affirm the Board's decision.

Yorkey next argues that even if the Board correctly construed the language of Claim 39, there is no written description in the Diab application to support it. The written description requirement set forth by 35 U.S.C. § 112, ¶ 1 states that:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.

35 U.S.C. § 112, ¶ 1. Whether the written description requirement is met is a question of fact. Martek Biosciences Corp. v. Nutrinova, Inc., 579 F.3d 1363, 1369 (Fed. Cir. 2009) (citing Wang Labs., Inc. v. Toshiba Corp., 993 F.2d 858, 865 (Fed. Cir. 1993)). The test for sufficiency of support in a parent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." In re Kaslow, 707 F.2d 1366, 1375 (Fed. Cir.1983). This Court will uphold the Board's finding that the Diab application's claims are adequately described so long as that finding is supported by substantial evidence in the record. See Shu-Hui Chen v. Bouchard, 347 F.3d 1299, 1304 (Fed. Cir. 2003).

Yorkey contends that the Diab application does not disclose solving three intensity signal functions each of which represents a signal as a function of saturation. Rather, according to Yorkey, the Diab application discloses solving (at most) only two intensity signal functions to determine a value for oxygen saturation; the third signal is used merely to generate a noise reference signal that is used to subtract the motion-induced noise component from the other two remaining signals. The resulting functions representing those two signals are subsequently solved to yield a value representing the oxygen saturation.

Yorkey disputes Baura's expert testimony (with which the Board ultimately agreed) that the "solving the three functions" limitation is supported because the Diab application allegedly discloses "using the third wavelength" to generate a reference signal and therefore the third signal is still used in the ultimate calculation of saturation Yorkey maintains that the third intensity signal is not represented as a function of

saturation, and testimony concerning "using" signals did not provide support for a claim requirement of "solving" three functions, each of which represents a signal as a function of saturation.

The specification of the Diab application first specifies the emitter and detection of the third signal at issue:

> The third [light-emitting diode ("LED")] 304 is used to measure a third signal $S_{\lambda c}(t)$ to be used to determine saturation using the ratiometric method. The third LED 304 is time multiplexed with the red and infrared LED's [sic] 300 and 302. Thus, a third signal is input to the common processing circuitry in sequence with the signals from red and infrared LED's [sic] 300 and 302.
>
> ....
>
> For pulse oximetry measurements using the ratiometric method, the signals (logarithm converted) transmitted ... at each wavelength λ_a, λ_b, and λ_c are:

$$S_{\lambda a}(t) = S_{\lambda red1}(t) = \varepsilon_{HbO2,\,\lambda a}\, c^{A}_{HbO2} x^{A}(t) + \varepsilon_{Hb,\lambda a} c^{A}_{Hb} x^{A}(t) + \varepsilon_{HbO2,\,\lambda a}\, c^{V}_{HbO2} x^{V}(t) + \varepsilon_{Hb,\lambda a} c^{V}_{Hb} x^{V}(t) + n_{\lambda a}(t). \quad (93)$$

$$S_{\lambda b}(t) = S_{\lambda red2}(t) = \varepsilon_{HbO2,\,\lambda b}\, c^{A}_{HbO2} x^{A}(t) + \varepsilon_{Hb,\lambda b} c^{A}_{Hb} x^{A}(t) + \varepsilon_{HbO2,\,\lambda b}\, c^{V}_{HbO2} x^{V}(t) + \varepsilon_{Hb,\lambda b} c^{V}_{Hb} x^{V}(t) + n_{\lambda b}(t). \quad (94)$$

$$S_{\lambda c}(t) = S_{\lambda IR}(t) = \varepsilon_{HbO2,\,\lambda c}\, c^{A}_{HbO2} x^{A}(t) + \varepsilon_{Hb,\lambda c} c^{A}_{Hb} x^{A}(t) + \varepsilon_{HbO2,\,\lambda c}\, c^{V}_{HbO2} x^{V}(t) + \varepsilon_{Hb,\lambda c} c^{V}_{Hb} x^{V}(t) + n_{\lambda c}(t). \quad (95)$$ [2]

In each equation, the term $S_{\lambda(red1),\,(red\ 2),\,or\,(IR)}(t)$ refers to the function representing the signal detected from each of the three wavelengths emitted by the probe's LEDs. Thus, as a baseline matter, the third signal introduced in this embodiment of the invention claimed by the Diab application represented by Equation (94) (the Red2 LED signal) is not merely composed of motion-induced noise, but rather contains

[2] Each equation is, of course, a function because the term $S_{\lambda(red1)\ red\ 2)\ or\ (IR)}(t)$ represents the result of an operation.

components of both transmitted light representing oxygen saturation (i.e., $\varepsilon_{HbO2,\ \lambda b}$ $c^{A}_{HbO2}x^{A}(t)$ + $\varepsilon_{Hb,\lambda b}c^{A}_{Hb}x^{A}(t)$ + $\varepsilon_{HbO2,\ \lambda\ b}$ $c^{V}_{HbO2}x^{V}(t)$ + + $\varepsilon_{Hb,\ \lambda\ b}$ $c^{V}_{Hb}x^{V}(t)$ + $n_{\lambda b}(t)$, where HbO2 represents the concentration of oxygen-bound hemoglobin, Hb represents the concentration of free hemoglobin, A represents arterial blood, V represents venous blood and n represents motion-induced noise). This function is, in effect, identical to the other two functions representing the other two signals detected with the exception of the varying wavelengths.

The Diab application teaches that the two red wavelengths are selected to satisfy a proportionality relationship which removes the primary signal portions $S_{\lambda red1}(t)$ and $S_{\lambda red2}(t)$ yielding a secondary reference, n'(t) by choosing two wavelengths that cause the primary portions of the measured signals for each to become linearly dependent. By so choosing, the venous portions likewise become linearly dependent, which allows removal of these signals, generating the secondary reference signal, n'(t). The signal so generated can be used in a correlation canceller, such as an adaptive canceller, to remove the noise portion of the signal.

Claim 39 of the Diab application recites, in relevant part:

> [E]ach of said functions includes a plurality of coefficients related to the wavelengths, the coefficients of said third function being determined based upon the coefficients of the first and second functions, and further comprising the steps of approximating at least a portion of said first and second intensity signals based upon the third intensity signal, and determining said saturation from said approximation of said first and second intensity signals.

In the example of the preferred embodiment recited above from the specification, each function (as represented by Equation (93), (94), and (95)) includes a plurality of coefficients (both terms relating to $S_{\lambda red1}(t)$ and $S_{\lambda red2}(t)$ as well as to $n_{\lambda n}(t)$), and the

coefficients of the third function are based upon the coefficients of the first and second functions (and do not merely represent a pure motion-induced noise coefficient). Moreover, the recited specification approximates at least a portion of the first and second intensity signals based upon the third intensity signal (performed by selecting a wavelength for the third emitted signal that satisfies a proportionality relationship which removes the primary signal portions $S_{\lambda red1}(t)$ and $S_{\lambda red2}(t)$, yielding a secondary reference, n'(t), which in turn can be used to refine the relationship between the first and secondary signals) which in turn yields a value for the oxygen saturation of the blood, based upon the approximation of the first and second signals so derived.

The language in the limitation thus provides a written description of the limitation that would reasonably convey to an artisan of ordinary skill that the inventor had possession at that time of the claimed subject matter. See Lockwood v. Am. Airlines, Inc., 107 F.3d at 1571-72 (Fed. Cir. 1997). We conclude therefore that there is substantial evidence supporting the Board's denial of Yorkey's Motion 1 that claim 39 of the Diab application fails to comply with the written description of requirement of 35 U.S.C. § 112, ¶ 1.

CONCLUSION

For the reasons set forth above, we affirm the Board's denial of both Yorkey's motion for a judgment of no interference-in-fact and his motion for judgment that claim 39 of the Diab application fails to comply with the written description of requirement of 35 U.S.C. § 112, ¶ 1.

AFFIRMED